

## WHAT IS CLAIMED IS :

1. An optical switch comprising:

a first optical amplifier;

5 a second optical amplifier connected in cascade to said first optical amplifier; and

a first control circuit for outputting first and second control signals for switching a gain of said first and second optical amplifiers.

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2. The optical switch according to claim 1, wherein said first and second optical amplifiers comprise a semiconductor optical amplifier.

15 3. The optical switch according to claim 1, wherein said first and second optical amplifiers comprise an optical fiber amplifier.

4. The optical switch according to claim 1, further comprising:  
20 a first optical isolator inserted between said first and second optical amplifiers.

5. The optical switch according to claim 1, further comprising:  
a first optical coupler connected to an input of said first  
25 optical amplifier; and

a second optical coupler inserted between said first and second optical amplifiers.

6. The optical switch according to claim 1, further comprising:

an optical power monitor for detecting an optical power outputted from said second optical amplifier.

7. The optical switch according to claim 1, further comprising:

5       a third optical coupler inserted between said first and second optical amplifiers, said third optical coupler having an input-side first branch connected to an output of said first optical amplifier and an output-side branch connected to an input of said second optical amplifier; and

10       a third optical amplifier whose output is connected to an input-side second branch of said third optical coupler.

8. The optical switch according to claim 7, wherein said third optical amplifier comprises a semiconductor optical amplifier.

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9. The optical switch according to claim 7, wherein said third optical amplifier comprises an optical fiber amplifier.

10. The optical switch according to claim 7, further comprising:

20       a fourth optical coupler connected to the input of said first optical amplifier.

11. The optical switch according to claim 7, further comprising:

25       an optical power monitor for detecting the optical power outputted from said second optical amplifier.

12. The optical switch according to claim 4, further comprising:

      a second optical isolator connected to the input of said first optical amplifier; and

a third optical isolator connected to the output of said second optical amplifier.

13. The optical switch according to claim 1, further comprising:

5       a first optical filter inserted between said first and second optical amplifiers, for passing a signal light wavelength alone therethrough.

14. The optical switch according to claim 13, further comprising:

10       a second optical filter connected to the output of said second optical amplifier, for passing the signal light wavelength alone therethrough.

15. The optical switch according to claim 1,

15       wherein said first optical amplifier comprises an optical fiber amplifier, and

      said optical fiber amplifier comprises:

      an erbium-doped optical fiber; and

20       a pumping source for generating a pumping light whose wavelength is in 980 nm wavelength region to be inputted to said erbium-doped optical fiber.

16. The optical switch according to claim 1, wherein at least one of said first and second optical amplifiers comprises a forward-pumped optical fiber amplifier.

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17. The optical switch according to claim 1, wherein at least one of said first and second optical amplifiers comprises a bidirectional-pumped optical fiber amplifier.

18. The optical switch according to claim 1, wherein at least one of said first and second optical amplifiers comprises an optical fiber amplifier having the pumping light generated by wavelength-division multiplexing.

19. The optical switch according to claim 1, wherein at least one of said first and second optical amplifiers comprises an optical fiber amplifier having the pumping light generated by polarization multiplexing.

20. An optical switch for a wavelength-division multiplexed light which is obtained by wavelength-division multiplexing a plurality of light signals, said optical switch comprising:

15       an optical wavelength demultiplexer for demultiplexing said wavelength-division multiplexed light into said plurality of light signals and outputting each of said plurality of light signals to each of a plurality of branches;

20       a plurality of single wavelength optical switches, each being connected to each of said plurality of branches; and

      an optical wavelength multiplexer for multiplexing the lights outputted from said plurality of single wavelength optical switches,

25       wherein each of said plurality of single wavelength optical switches comprises:

      a first optical amplifier;

      a second optical amplifier connected in cascade to said first optical amplifier;

      a control circuit for outputting first and second control

signals for switching a gain of said first and second optical amplifiers;

a first optical coupler connected to an input of said first optical amplifier; and

5 a second optical coupler inserted between said first and second optical amplifiers.

21. An optical switch for a wavelength-division multiplexed light which is obtained by wavelength-division multiplexing a  
10 plurality of light signals, said optical switch comprising:

an optical wavelength demultiplexer for demultiplexing said wavelength-division multiplexed light into said plurality of light signals and outputting each of said plurality of light signals to each of a plurality of branches;

15 a plurality of first optical couplers, each being connected to each of said plurality of branches;

a plurality of first optical amplifiers, each having an input connected to an output of each of said plurality of first optical couplers;

20 a plurality of second optical couplers, each having an input-side first branch connected to the output of each of said plurality of first optical amplifiers;

at least one first optical wavelength multiplexer whose input is connected to each of output-side branches of some of said  
25 plurality of second optical couplers;

at least one second optical amplifier whose input is connected to the output of said at least one first optical wavelength multiplexer; and

a control circuit for outputting first and second control

signals for switching a gain of said first and second optical amplifiers.

22. The optical switch according to claim 21, further comprising:

5       a second optical wavelength multiplexer whose input is connected to the output of said at least one second optical amplifier.

23. The optical switch according to claim 1, further comprising:

10       a signal light detector for detecting whether or not a signal light is inputted to said first optical amplifier and then outputting the result of the detection as a detect signal; and

      a second control circuit for providing said first and second optical amplifiers with control signals for shutting down said first and second optical amplifiers, when said detect signal is inputted to said second control circuit to indicate that said signal light is not inputted to said first optical amplifier.

24. An optical network in which a plurality of optical nodes are connected through an optical fiber transmission lines,

20       wherein each of said plurality of optical nodes comprises an optical switch as defined in claim 20.

25. An optical network in which a plurality of optical nodes are connected through optical fiber transmission lines,

      wherein each of said plurality of optical nodes comprises an optical switch as defined in claim 23.